

S I M

**SIM
SCIENCE WORKING GROUP**

MISSION DESIGN STATUS

23 April, 1998

S. S. Dallas

Mission System Manager

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INTERFEROMETRY
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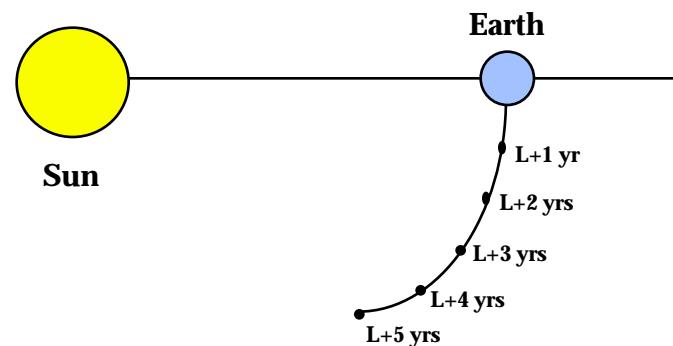
AGENDA

- Earth Trailing Solar Orbit
- Mission Design Data
- Launch Vehicle System
- Candidate Launch Vehicles

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MISSION DESIGN

Earth-Trailing Solar Orbit



CHARACTERISTICS

C3	0.4 Km² /Sec²
Occultations	None
5-yr Radiation Dose	20 Krads
Launch Vehicle	Delta III or EELV
Propulsion System	Mono-Prop
Delta-V Req'd?	No
Orbit Determination	Range/Doppler
Earth-S/C Range	Up to 95 Million Km
Launch Period	June, 2005
Mission Duration	5 Years

ONE YEAR OBSERVATION PLAN

Grid Observations	25.6%
Astrometric Observations	49.4%
Imaging	6.1%
Slewing	5.9%
Calibration/Eng/Settling	13.0%
Total Observing Efficiency	81.1%

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MISSION DESIGN DATA

INPUT DATA

Sun Radius =	696,000 km
Earth Radius =	6378 km
Moon Radius =	1738 km
Sun-Earth Distance =	1.496×10^8 km
Earth-Moon Distance =	384,000 km
Angular Radius of Sun at 1 AU =	0.27 deg
Drift-away rate =	0.11 AU/yr

ORBIT DATA

Time after Launch (months)	Earth - S/C Distance ($\times 10^6$ km)	Angular Diameter of Earth (deg)	Angular Diameter of Moon (deg)	Angular Separation of Earth-Moon (deg)
1	1.37	0.53	0.15	15.64
2	2.74	0.27	0.07	7.97
3	4.11	0.18	0.05	5.33
4	5.49	0.13	0.04	4.00
5	6.86	0.11	0.03	3.21
6	8.23	0.09	0.02	2.67
12	16.46	0.04	0.01	1.34
18	24.68	0.03	0.01	0.89
24	32.91	0.02	0.01	0.67
30	41.14	0.02	0.00	0.53
36	49.37	0.01	0.00	0.45
42	57.60	0.01	0.00	0.38
48	65.82	0.01	0.00	0.33
54	74.05	0.01	0.00	0.30
60	82.28	0.01	0.00	0.27

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LAUNCH VEHICLE SYSTEM



Delta III

First Stage: Liquid Oxygen/ RP-1 (Kerosene), Rocketdyne RS-27A Main Engine, Nine Strap-on Solid Rocket Motors

Second Stage: Cryogenic (O_2/H_2)Pratt & Whitney RL10B-2 Engine

Pay. Fairing: 13.3 Foot Diameter
12.3 Foot Usable Diameter

Injected Mass: 2700 Kg into an Earth Trailing Orbit

First Flight: 2nd Quarter, 1998

CANDIDATE LAUNCH VEHICLES

Launch Vehicle	Injected Mass	Cost
Atlas IIA (LPF)	2150	
Atlas IIAS (LPF)	2650	
Delta III	2700	\$109.4 M
Delta IV	2820	
Lockheed MLV-A		
Assumptions:		
1. Earth Trailing Orbit ($C_3=0.4 \text{ Km}^2/\text{Sec}^2$)		
2. Current Best Estimate of Flight System is 1909 Kg.		
3. Real Year \$.		

EARTH TRAILING ORBIT VERSUS L2 ORBIT

- Advantages
 - Greater Mass Margin (~90 Kg)
 - Mono-propellant Propulsion System instead of a Bi-propellant System (less contamination)
 - No Station Keeping Maneuvers Required
 - S/C Antenna Points Away From The Sun During Communications
 - Smaller Reaction Wheels (less vibration)
- Disadvantages
 - Communication Distance Increases With Time (propellant mass and telecom system must be sized for the expected mission duration)